Santa Clara County
Flood Control and
Water District

Groundwater Conditions 71-72

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SANTA CLARA COUNTY FLOOD CONTROL AND WATER DISTRICT

ANNUAL SURVEY REPORT ON GROUNDWATER CONDITIONS

by

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ANNUAL SURVEY REPORT
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GROUNDWATER CONDITIONS
1971-72

SUMMARY

During the 1971-72 water year (July 1, 1971 through June 30, 1972), water supply deficits of 42,000 acre-feet in the Santa Clara Valley Groundwater Basin, 6,000 acre-feet in the Coyote Groundwater Basin and 46,000 acre-feet in the Llagas Groundwater Basin were experienced. This deficit, which occurred even though imported water was continually recharged throughout the year, was due to below average rainfall during the period.

During the 1971-72 water year, 92,150 acre-feet of imported water was delivered through the South Bay Aqueduct and the District's In-County Water Distribution System for use in the Santa Clara Valley Groundwater Basin. Of this amount, 48,819 acre-feet was delivered to retail water contractors after treatment at the District's Rinconada Water Treatment Plant, 801 acre-feet of raw water was delivered directly from the District's pipelines for use by miscellaneous contractors, and the remaining 42,530 acre-feet of imported water was used to recharge the groundwater basin. The District requested its entitlement of 88,000 acre-feet plus an additional 12,000 acre-feet of surplus water for a total of 100,000 acre-feet for the calendar year 1972. No imported water was delivered to the Coyote or Llagas Groundwater Basins.

The groundwater quality has remained high and is usable for all beneficial purposes; however, some shallow wells around the edge of San Francisco Bay have yielded high chlorides.

INTRODUCTION

This is a survey report on groundwater conditions in the three major groundwater basins of Santa Clara County for the water year 1971-72. These three major interconnected groundwater basins occupy about 240,000 acres of the 849,000 acres in Santa Clara County. These basins are shown on Plate 1 and are the Santa Clara Valley, the Coyote, and the Llagas Groundwater Basins.

During the fiscal year 1971-72, a groundwater charge was levied by the District in Zones W-2, W-3.1, W-3.2, W-3.3, and W-3.4. These zones are shown on Plate 1. Except for the Palo Alto area, the boundaries of Zone W-2 generally follow the boundaries of the Santa Clara Valley Groundwater Basin and the boundaries of Zones W-3.1, W-3.2, W-3.3., and W-3.4 include portions of the Coyote Groundwater Basin and related service area. The boundary of Zone W-2 was modified by the District to include the Palo Alto area of the groundwater basin in 1972. This change will be effective for groundwater charge purposes in fiscal year 1972-73.

In Zone W-3, an ad valorem tax is levied in lieu of a groundwater charge; this zone is shown on Plate 1 and includes most of the Coyote Groundwater Basin (except for Zones W-3.1, W-3.2, W-3.3, and W-3.4) and a portion of the Llagas Groundwater Basin. No groundwater charge or ad valorem tax in lieu of groundwater charge is levied in the remainder of the Llagas Basin.

WATER BALANCE ANALYSIS

The net change in storage during the one-year period is obtained by multiplying the change in elevation of the water table in the appropriate unconfined areas of the groundwater basins by the corresponding specific yield. The changes in elevation of the groundwater tables were computed using contour maps presenting lines of equal change in water elevation (Plate 3). The specific yield (that amount of water expressed in percent that can be obtained from a unit volume of aquifer material) was obtained from "Santa Clara Valley Investigation", Bulletin 7, by the California State Water Resources Board. Accordingly, the net change in storage in the Santa Clara Valley, Coyote, and Llagas Groundwater Basins was found to be about -42,000, -6,000, and -46,000 acre-feet, respectively.

These deficits occurred due to below average rainfall, which was about 50 percent of normal. Since demands for water exceeded the supply, the groundwater elevations dropped.

The storage changes so obtained were verified by estimating the magnitude of the various hydrologic components of water supply and disposal. Within any water year the essential elements of water supply to the groundwater basins of the District are precipitation, surface and subsurface inflow, and surface import. This water supply is disposed of by consumptive use, surface and subsurface outflow and export. The difference between the water supply and the disposal of water is the seasonal surplus or deficiency that causes groundwater table fluctuations as water is replaced in or removed from storage.

Figure 1 shows the principal elements of water supply and disposal and indicates deficits of 54,000, 7,000, and 45,000 acre-feet, respectively, for the Santa Clara Valley, Coyote, and Llagas Groundwater Basins (as compared with deficits of 42,000, 6,000, and 46,000 acre-feet, respectively, obtained as described above). The discrepancy observed between the storage change obtained as a net balance of hydrologic components and that obtained as a product of change in water levels and specific yield is the result of uncertainties involved in the estimation of subsurface inflows, consumptive use, and the specific yield of aquifers. However, these results provide, within the accuracy expected of this type of analysis, satisfactory checks of the change in storage calculations.

GROUNDWATER CONTOURS

A groundwater contour map, showing lines of equal elevation of water levels in wells for the three major groundwater basins (Santa Clara Valley, Coyote, and Llagas) as of September 1, 1972 (seasonal low), is shown in Plate 2. Plate 3 shows lines of equal change in depth to water in wells between July 1971 and July 1972 and Plate 4 shows lines of equal depth to water as of September 1, 1972.

For the period 1967-72, the fluctuation of average water levels in the Santa Clara Valley, Coyote and Llagas Basins are presented in Figure 2. These levels represent the weighted average of depths to water levels in approximately 200 key wells, which are monitored at the beginning of each month.

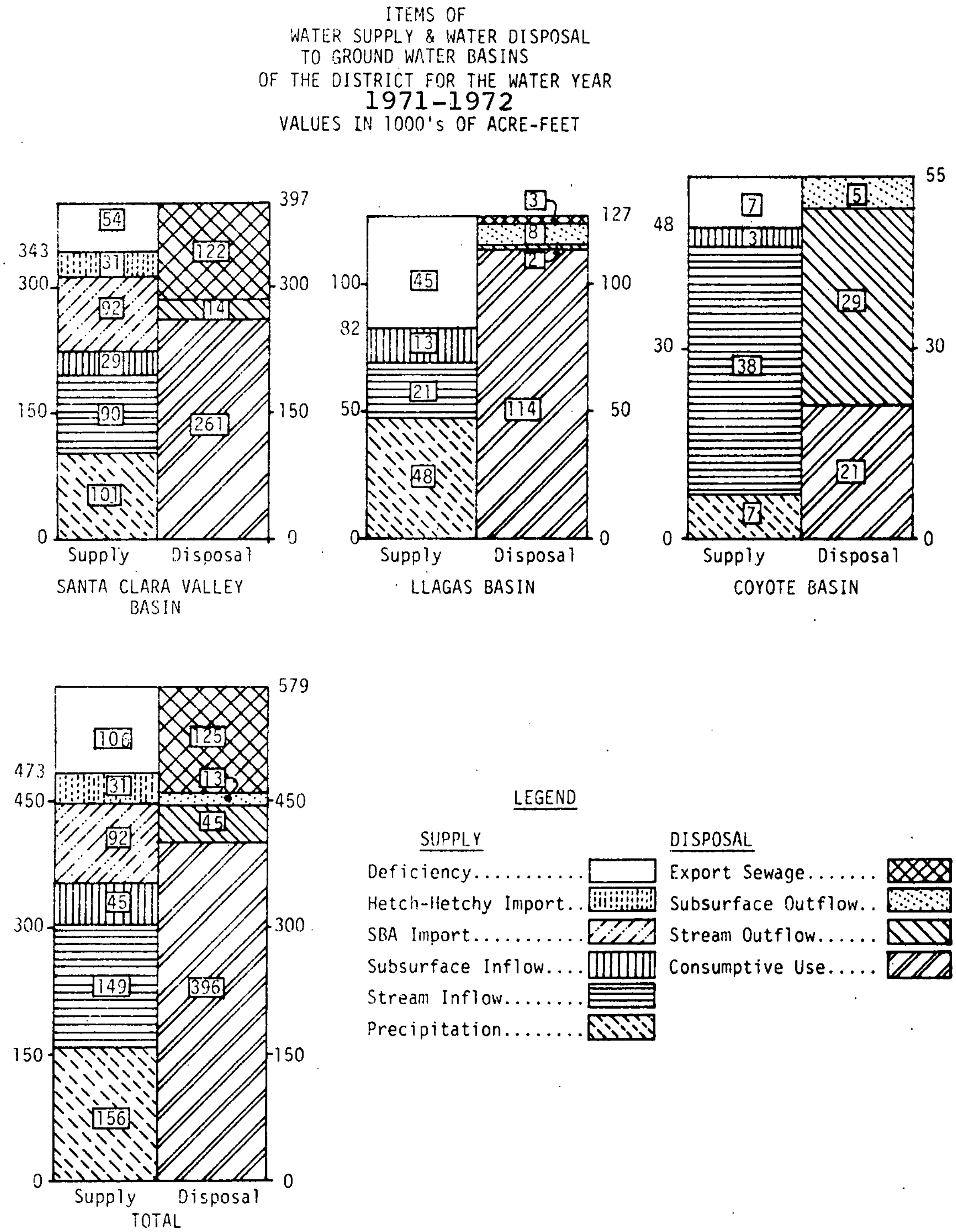


FIGURE 1 HYDROLOGIC BALANCE OF GROUNDWATER BASINS

FIG 1

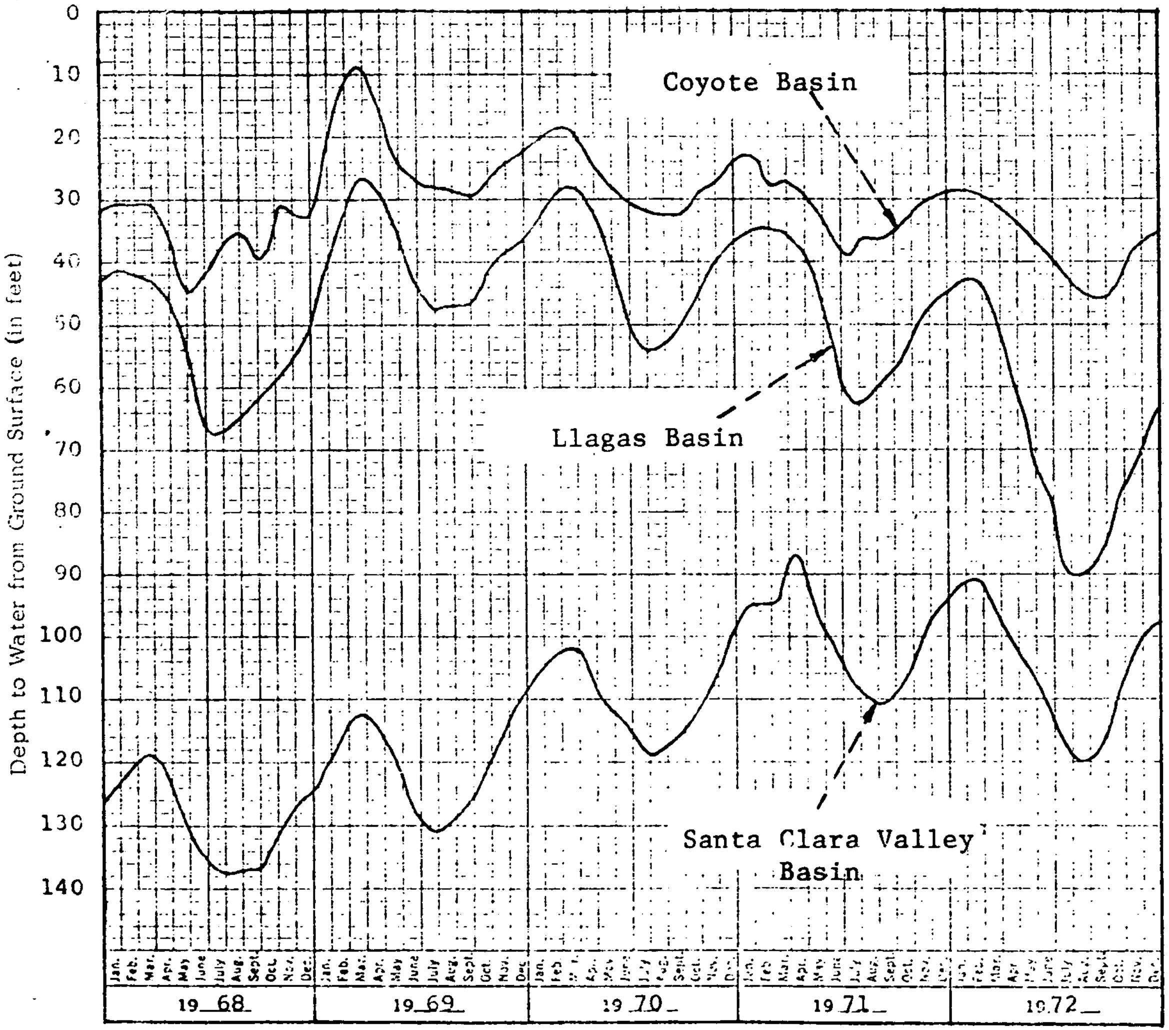


Figure 2. Fluctuations of Average Water Level

In general, the water levels in the Santa Clara Valley and Coyote Groundwater Basins have fallen an average of about 10 feet. Those in the Llagas Groundwater Basin have fallen an average of about 28 feet during the water year 1971-72 (Plate 3).

SEASONAL GROUNDWATER EXTRACTIONS

Table 1 shows the estimates of seasonal groundwater extractions for the water year of this report (1971-72). Also included in this table are projected values for the water years of 1972-73 and 1973-74. Values for the water year 1971-72 in the Santa Clara Valley Groundwater Basin are based on statements submitted by groundwater users as a requirement of the District's groundwater charge program, whereas all other values in Table 1 are estimated based on assumed average year conditions and the assumption that treated water deliveries and artificial and natural recharge quantities will be sustained at 1971-72 levels.

GROUNDWATER QUALITY

Groundwater in Santa Clara County occurs both in the confined and unconfined conditions. The unconfined conditions exist mainly along the peripheral areas of Santa Clara Valley, in the Coyote Basin, and north of Rucker Avenue in the Llagas Basin. In the confined areas, groundwater is generally pumped out of the deeper aquifers. This water is generally better quality water than is found in the overlying shallow unconfined aquifers.

The quality of groundwater within the County is generally good and meets the 1962 U.S.P.H.S. Drinking Water Standards. However, in certain areas of Alviso, Los Altos, Palo Alto, Morgan Hill, and Gilroy, inferior quality water has been found. Water in shallow aquifers in the Alviso and Palo Alto areas surrounding San Francisco Bay are high in chlorides indicating the possibility of seawater intrusion. It has been observed that in some of these areas chloride concentrations increase and decrease with time. This could indicate that the seawater-freshwater interface is advancing and retreating with time.

Some wells in the Los Altos area of the Santa Clara Valley Basin and in the Morgan Hill and Gilroy areas were observed to contain high nitrate concentrations, sometimes exceeding the 1962 U.S.P.H.S. Standards. In addition, some wells in the Morgan Hill area have been observed to contain fluorides higher than specified by U.S.P.H.S. Standards.

TABLE 1

SEASONAL GROUNDWATER EXTRACTIONS FROM THE GROUNDWATER BASINS OF THE DISTRICT
(VALUES IN ACRE-FEET)

Water Year and Use	Groundwater Basin			Total
	Zone W-2	Coyote	Llagas	
1971-72				
Agric. Use	24,000*	13,000	70,000	107,000
Urban Use	142,000*	2,000	12,000	156,000
Total	166,000*	15,000	82,000	263,000
1972-73				
Agric. Use	20,000	10,000	58,000	88,000
Urban Use	132,000	2,000	12,000	146,000
Total	152,000	12,000	70,000	234,000
1973-74				
Agric. Use	18,000	10,000	60,000	88,000
Urban Use	137,000	2,000	13,000	152,000
Total	155,000	12,000	73,000	240,000

*These are the recorded extractions.

Water Samples from some wells located in the Milpitas and Mountain View areas were observed to contain high total dissolved solids and boron. A graphical representation of temporal changes in water quality parameters of nine selected wells is shown in Figures 3, 4 and 5. The locations of the wells are shown on Plate 1.

IMPORTED WATER

The major source of imported supplemental water for Santa Clara County is the South Bay Aqueduct. The other source of imported water is from the Hetch Hetchy Aqueduct. During the 1971-72 water year, 92,150 acre-feet of water was imported through the South Bay Aqueduct. Of this amount, 42,530 acre-feet was delivered to percolation areas for recharge into the Santa Clara Valley Groundwater Basin, and 48,819 acre-feet was treated at the District's Rinconada Water Treatment Plant and delivered to the consumers through retail water agencies. In addition, 801 acre-feet of imported raw water was delivered directly from District pipelines for use by miscellaneous contractors. For the calendar year 1972, the contract amount of 88,000 acre-feet plus an additional 12,000 acre-feet of surplus water for a total of 100,000 acre-feet was delivered.

The water imported through the Hetch Hetchy Aqueduct (30,484 acre-feet during 1971-72) is delivered directly into the water supply systems of Milpitas, Sunnyvale, Mountain View and the Purissima Water District in Zone W-2 of Northern Santa Clara County.

FINDINGS

1. During the water year 1971-72, the net decrease in storage in the Santa Clara Valley, Coyote and Llagas Groundwater Basins was found to be about 42,000, 6,000 and 46,000 acre-feet, respectively.

2. The estimated amounts of groundwater extracted during the water year of this report, 1971-72, and the corresponding projected values for the water years 1972-73 and 1973-74 are as follows (in acre-feet):

Groundwater Basin	1971-72	1972-73	1973-74
Santa Clara Valley	166,500	152,000	155,000
Coyote	15,000	12,000	12,000
Llagas	82,000	70,000	73,000

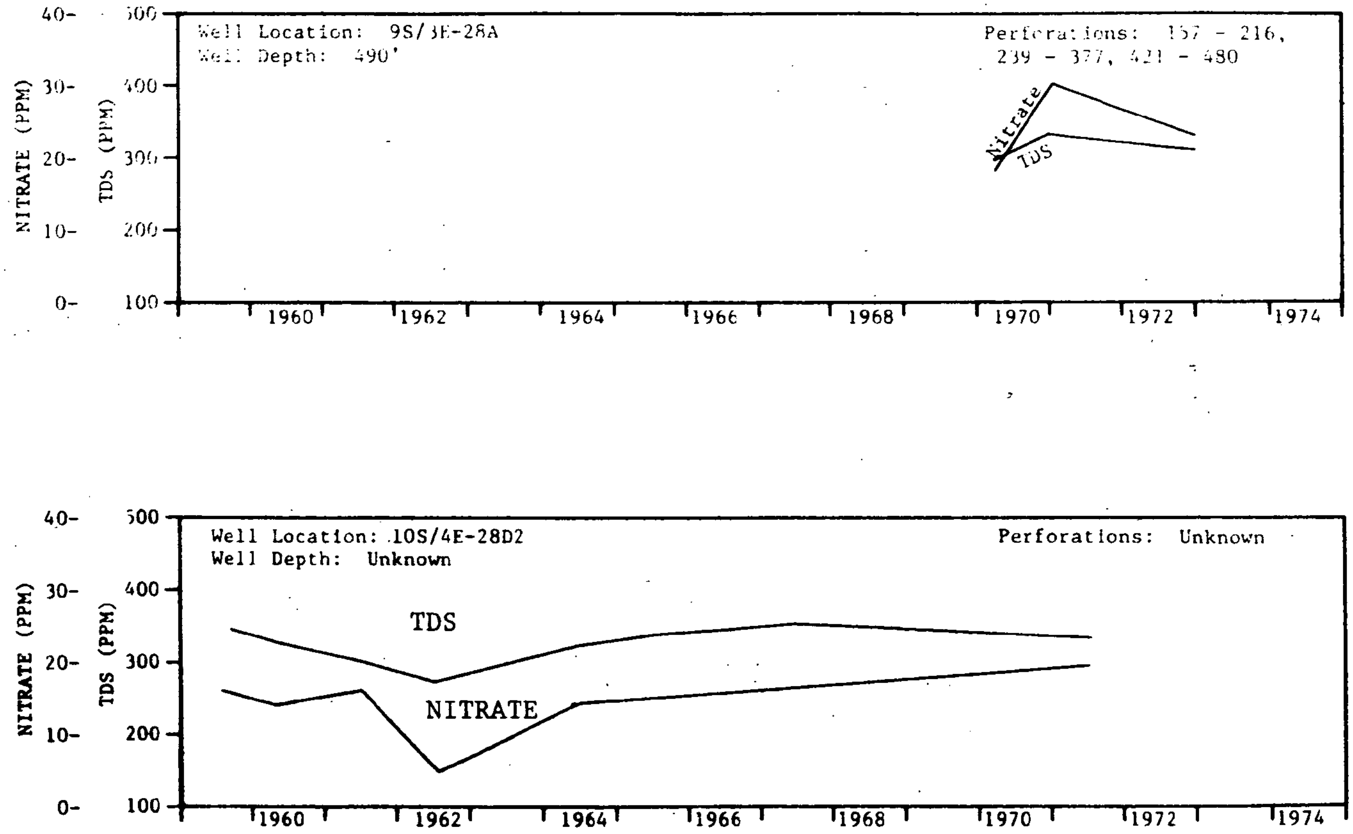


Figure 3. Temporal Variation of Nitrates and TDS-Llagas Basin

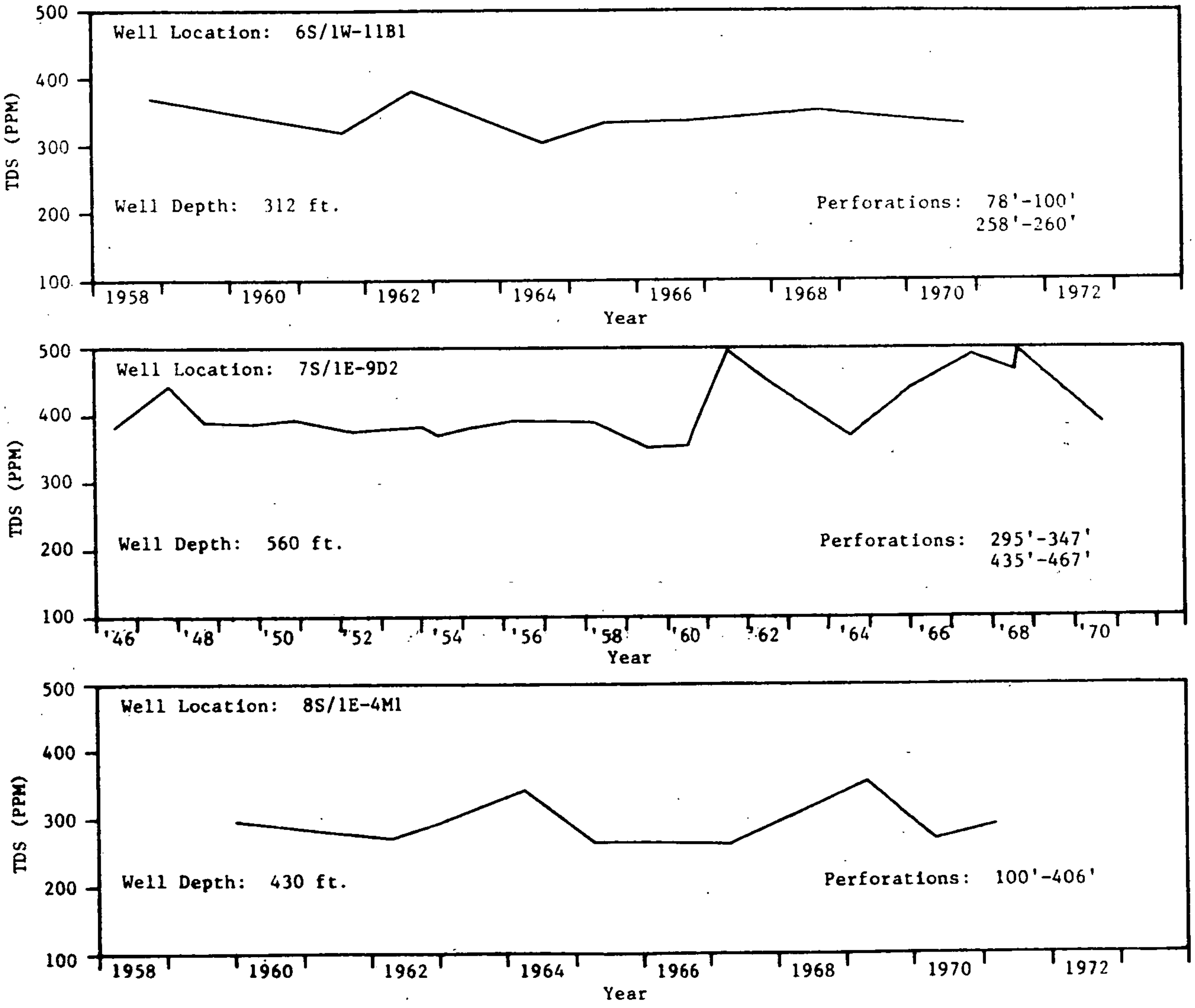


Figure 4. Temporal Variation of TDS-Santa Clara Valley Groundwater Basin

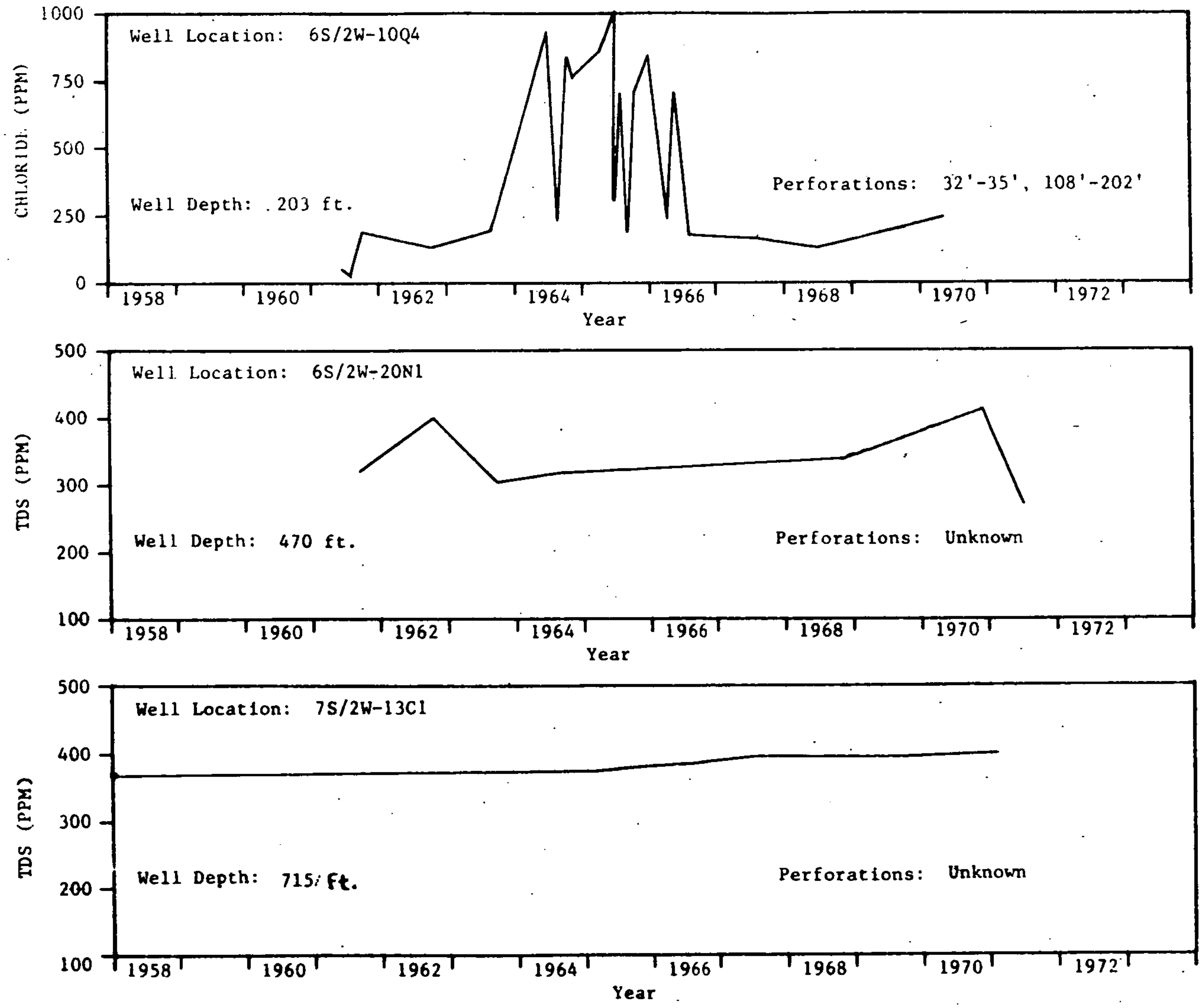


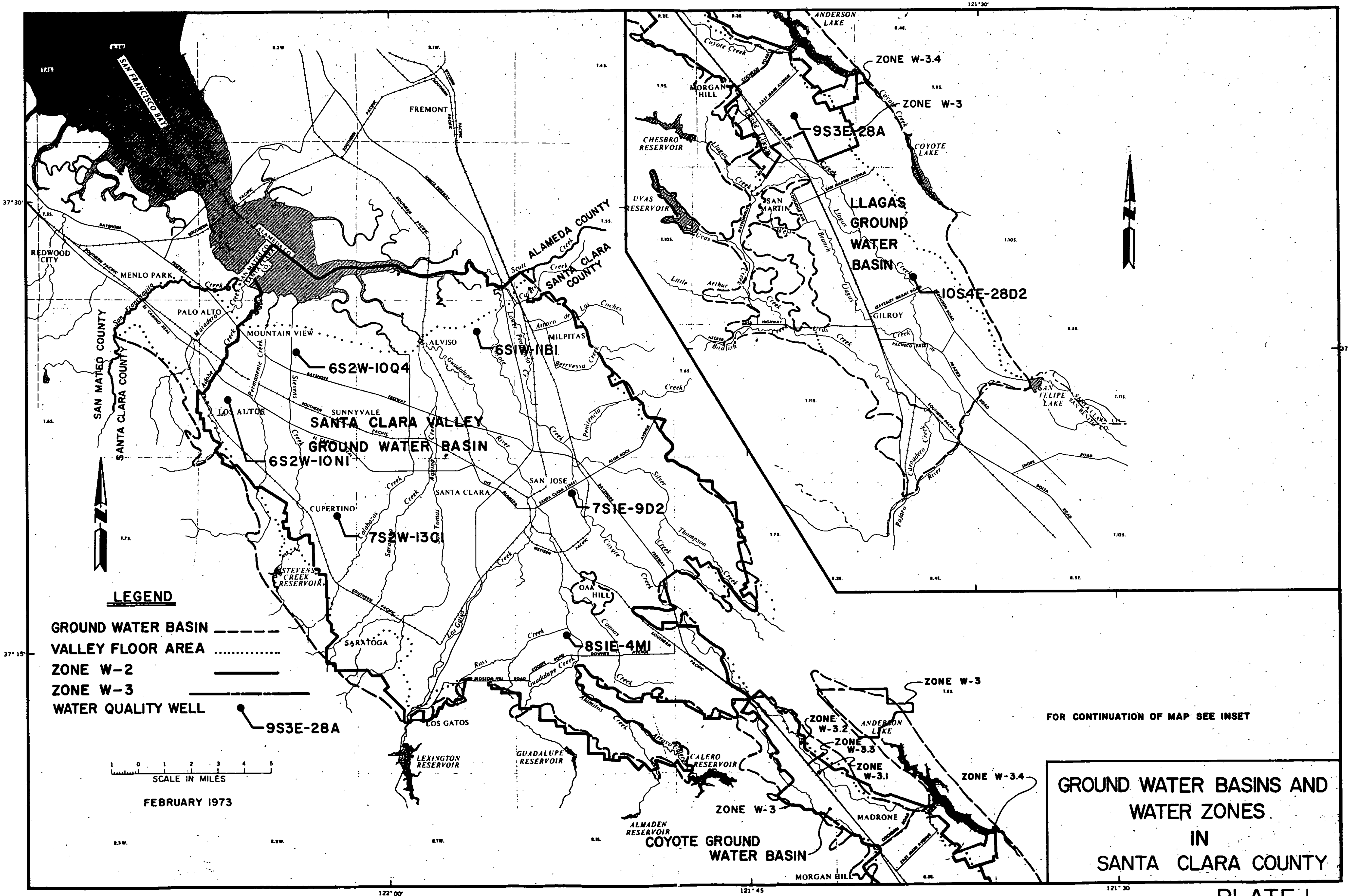
Figure 5. Temporal Variation of TDS and Chloride-Santa Clara Valley Groundwater Basin

3. During 1971-72 water levels in the Santa Clara Valley and the Coyote Groundwater Basins have fallen about 10 feet. Those in the Llagas Groundwater Basin have fallen about 28 feet during the same period.

4. The District is obligated by contract to purchase its entitlement of 88,000 acre-feet. An additional 12,000 acre-feet of surplus water was requested for a total of 100,000 acre-feet delivered through the South Bay Aqueduct in the calendar year 1973.

5. Water extracted from the three major groundwater basins has remained high in quality and usable for all beneficial purposes.

6. Some wells completed in the shallower aquifers (above 150 feet) yield water with high chlorides, indicating the possibility of saltwater intrusion.

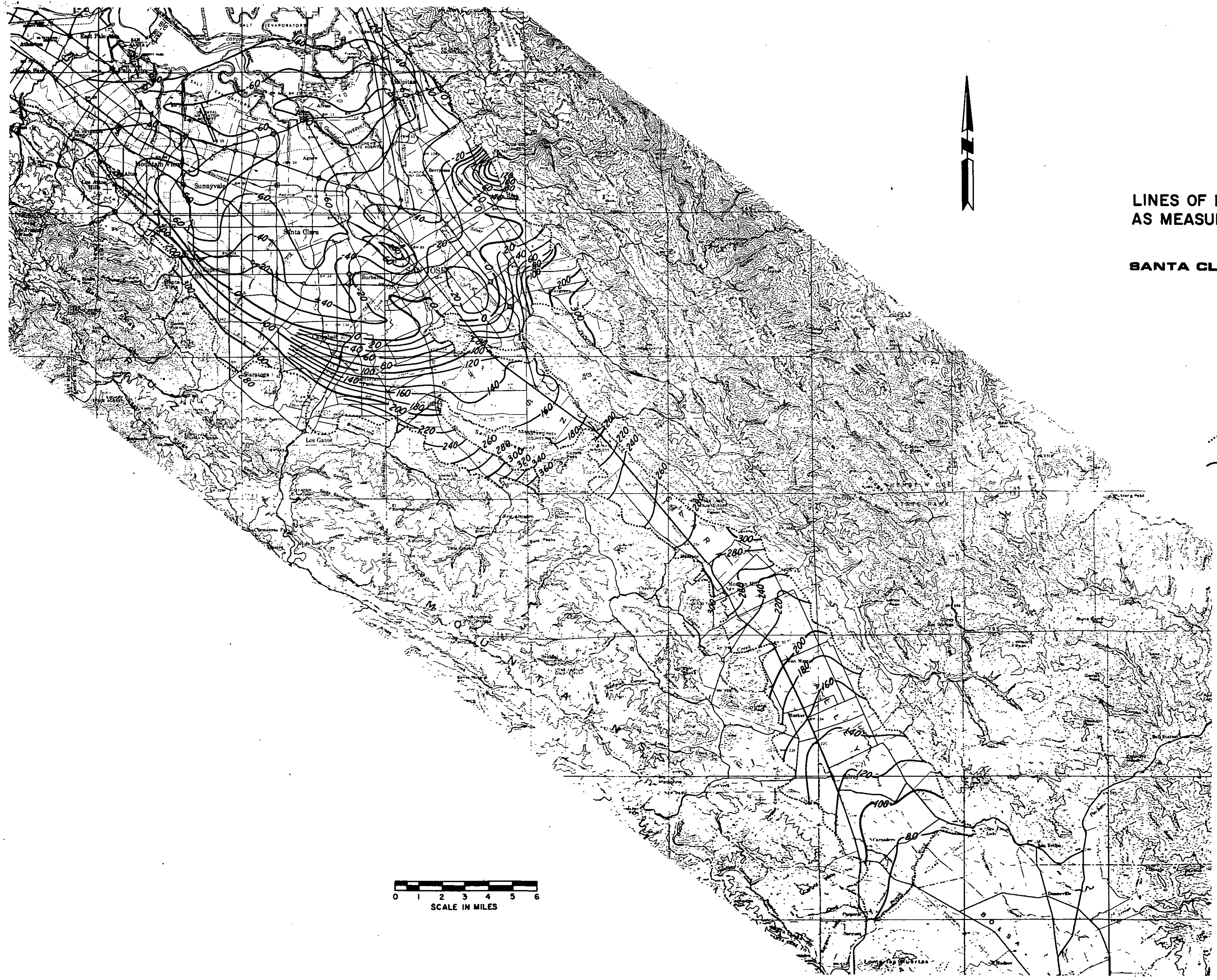


GROUND WATER BASINS AND WATER ZONES IN SANTA CLARA COUNTY

PLATE I

LINES OF EQUAL GROUND WATER ELEVATION AS MEASURED IN WELLS SEPTEMBER 1, 1972

SANTA CLARA COUNTY FLOOD CONTROL
AND
WATER DISTRICT



LEGEND

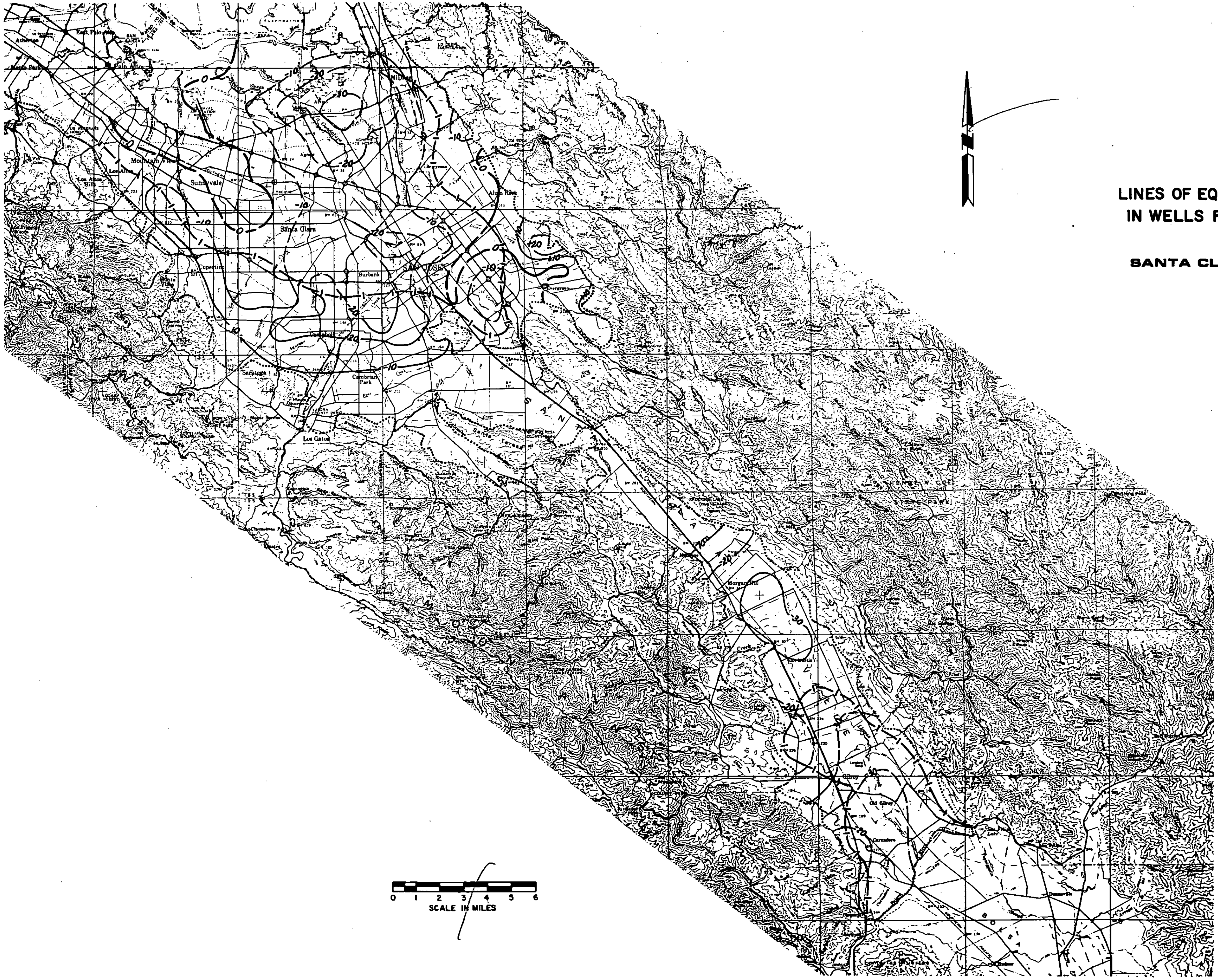
VALLEY FLOOR AREA

LINES OF EQUAL GROUND WATER ELEVATION

PLATE 2

LINES OF EQUAL CHANGE IN WATER ELEVATION IN WELLS FROM JULY 1, 1971 TO JULY 1, 1972

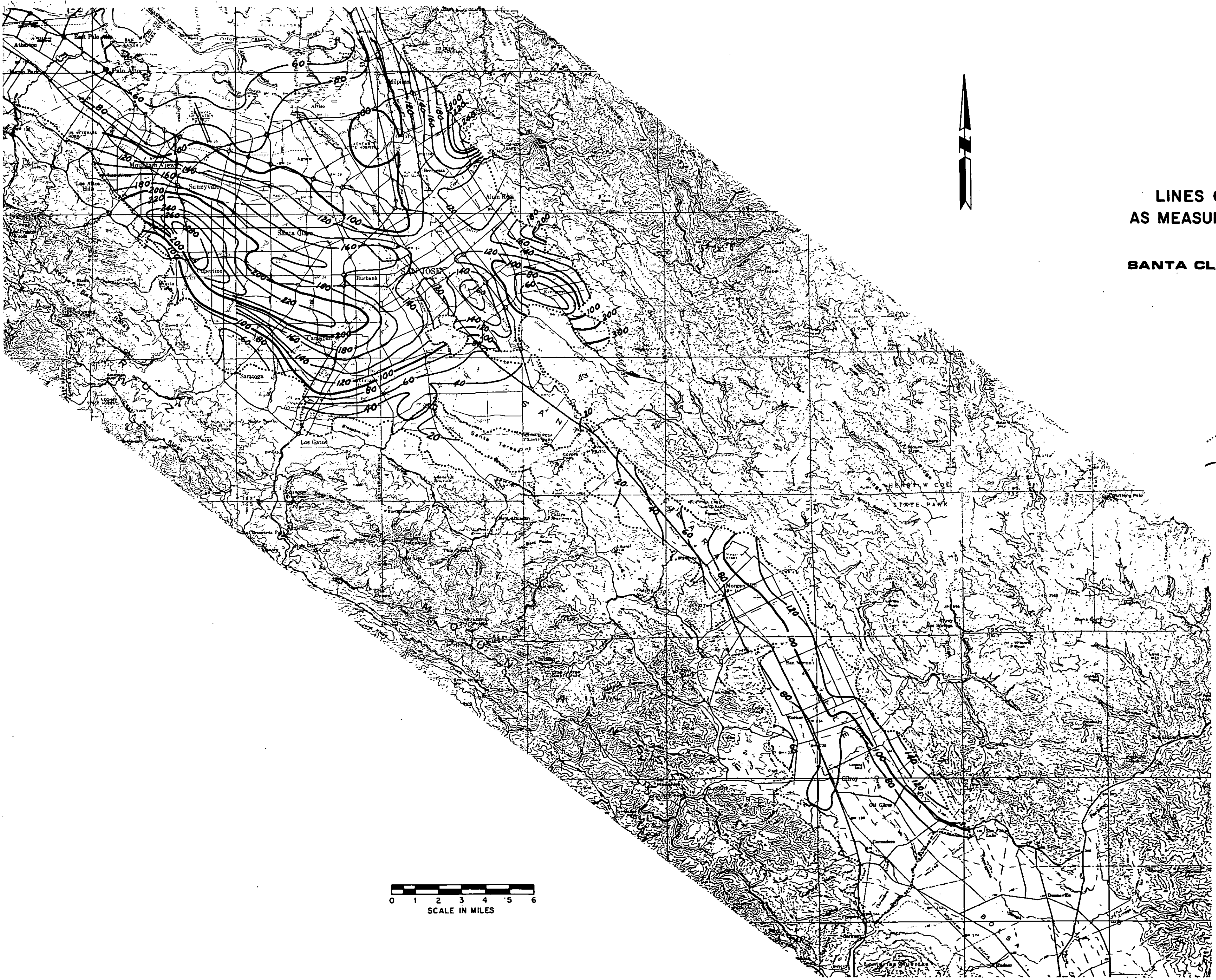
SANTA CLARA COUNTY FLOOD CONTROL
AND
WATER DISTRICT



LEGEND

- VALLEY FLOOR AREA
- 10 Blue — LINES OF EQUAL CHANGE IN WATER ELEVATION IN WELLS IN UN-CONFINED ZONE
- Blue 10 — LINES OF EQUAL CHANGE IN PIEZOMETRIC LEVEL IN WELLS IN CONFINED ZONE
- APPROXIMATE LIMIT OF CONFINED AQUIFER

PLATE 3



LINES OF EQUAL DEPTHS TO WATER
AS MEASURED IN WELLS SEPTEMBER 1, 1972

SANTA CLARA COUNTY FLOOD CONTROL
AND
WATER DISTRICT

LEGEND

⋯ VALLEY FLOOR AREA

~10~ LINES OF EQUAL DEPTH TO WATER

PLATE 4

Portions of this Report prepared by:
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